Area of Interest: Computers and Technology

Computer Programming (Co-op and Non Co-op Version)

Ontario College Diploma  Academic Year: 2020/2021
2 Years  Program Code: 0336X01FWO
Ottawa Campus

Our Program

Learn workplace-ready programming languages and practical applications to use wherever your career takes you.

The two-year Computer Programmer Ontario College Diploma program prepares you for a career in software development. The program also specializes in program development strategies (using object-oriented modelling), database design and database administration.

Use leading industry software products such as Oracle and CASE tools. Learn about programming languages such as Java, COBOL, SQL and PHP. Study object-oriented analysis and design, operating systems and coding in integrated environments, and learn how to debug, test, and maintain codes.

In your final semester, participate in a software development project working with external clients to gain real-world experience in the programming field.

Students also have the option to gain real-world experience through a paid co-operative education (co-op) work term (see Additional Information for more details). Please note that places in the co-op version of the program are subject to availability. Students who elect to apply to the non co-op version of the program may not have the opportunity to transfer to the co-op version at a later date.

Graduates may work in a variety of different fields, as almost all sectors of industry require programmers. You may be employed as:

- a software programmer
- a web programmer
- a business programmer
- an application programmer
- Graduates may also find opportunities in database design and database administration.

SUCCESS FACTORS

This program is well-suited for students who:

- Enjoy solving problems.
- Are life-long learners ready to meet the challenges presented by rapidly changing technology.
- Take pleasure in providing assistance to others (build computer systems to meet their needs).
- Enjoy working with others as a member of a team.
- Can work independently.
- Are organized in their work and pay attention to detail.
Employment

Graduates may find a variety of employment opportunities as applications programmers and systems analysts who can work independently and as part of a team to analyze, design, code, debug, test, implement and maintain application systems. Training in web programming, business programming, database design and database administration may also present job opportunities in those areas. Employment may be found in organizations of all sizes in both the public and private sectors.

Learning Outcomes

The graduate has reliably demonstrated the ability to:

- Identify, analyze, develop, implement, verify and document the requirements for a computing environment.
- Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools.
- Implement and maintain secure computing environments.
- Implement robust computing system solutions through validation testing that aligns with industry best practices.
- Communicate and collaborate with team members and stakeholders to ensure effective working relationships.
- Select and apply strategies for personal and professional development to enhance work performance.
- Apply project management principles and tools when working on projects within a computing environment.
- Adhere to ethical, legal, and regulatory requirements and/or principles in the development and management of computing solutions and systems.
- Support the analysis and definition of software system specifications based on functional and non-functional requirements.
- Contribute to the development, documentation, implementation, maintenance and testing of software systems by using industry standard software development methodologies based on defined specifications and existing technologies/frameworks.
- Apply one or more programming paradigms such as, object-oriented, structured or functional programming, and design principles, as well as documented requirements, to the software development process.
- Model, design, implement, and maintain basic data storage solutions.
- Contribute to the integration of network communications into software solutions by adhering to protocol standards.
- Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

Program of Study

<table>
<thead>
<tr>
<th>Level: 01</th>
<th>Courses</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CST8101</td>
<td>Computer Essentials</td>
<td>56.0</td>
</tr>
<tr>
<td>CST8116</td>
<td>Introduction to Computer Programming</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8215</td>
<td>Introduction to Database</td>
<td>70.0</td>
</tr>
<tr>
<td>CST8300</td>
<td>Achieving Success in Changing Environments</td>
<td>42.0</td>
</tr>
<tr>
<td>ENL1813T</td>
<td>Communications I</td>
<td>42.0</td>
</tr>
<tr>
<td>MAT8001C</td>
<td>Technical Mathematics for Computer Science</td>
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### Computer Programming (Co-op and Non Co-op Version)

<table>
<thead>
<tr>
<th>Level: 02</th>
<th>Courses</th>
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<tbody>
<tr>
<td>CST2355</td>
<td>Database Systems</td>
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<tr>
<td>CST8102</td>
<td>Operating System Fundamentals (GNU/Linux)</td>
<td>70.0</td>
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<tr>
<td>CST8284</td>
<td>Object Oriented Programming (Java)</td>
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<tr>
<td>CST8285</td>
<td>Web Programming</td>
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<tr>
<td>ENL2019T</td>
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**Choose one from equivalencies:**

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<tr>
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<tr>
<td>CST2234</td>
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<tr>
<td>CST2335</td>
<td>Mobile Graphical Interface Programming</td>
<td>56.0</td>
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<tr>
<td>CST8109</td>
<td>Network Programming</td>
<td>70.0</td>
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<tr>
<td>CST8288</td>
<td>Object Oriented Programming with Design Patterns</td>
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**Elective: choose 1**

<table>
<thead>
<tr>
<th>Courses</th>
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<tr>
<td>CST8283</td>
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<td>CST8390</td>
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<th>Courses</th>
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<td>Work Term II</td>
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<tr>
<td>CST8277</td>
<td>Enterprise Application Programming</td>
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<tr>
<td>CST8333</td>
<td>Programming Language Research Project</td>
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<tr>
<td>CST8276</td>
<td>Advanced Database Topics</td>
<td>56.0</td>
</tr>
<tr>
<td>CST8334</td>
<td>Software Development Project</td>
<td>56.0</td>
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**Fees for the 2020/2021 Academic Year**

Tuition and related ancillary fees for this program can be viewed by using the Tuition and Fees Estimator tool at [https://www.algonquincollege.com/fee-estimator](https://www.algonquincollege.com/fee-estimator).

Further information on fees can be found by visiting the Registrar’s Office website at [https://www.algonquincollege.com/ro](https://www.algonquincollege.com/ro).

Fees are subject to change.

Additional program related expenses include:

Supplies can be purchased at the campus store. For more information about books, go to [https://www.algonquincollege.com/coursematerials/](https://www.algonquincollege.com/coursematerials/).

**Admission Requirements for the 2021/2022 Academic Year**

**College Eligibility**

- Ontario Secondary School Diploma (OSSD) or equivalent. Applicants with an OSSD showing senior English and/or Mathematics courses at the Basic Level, or with Workplace or Open courses, will be tested to determine their eligibility for admission; OR
- Academic and Career Entrance (ACE) certificate; OR
- General Educational Development (GED) certificate; OR
- Mature Student status (19 years of age or older and without a high school diploma at the start of the program). Eligibility may be determined by academic achievement testing for which a fee of $50 (subject to change) will be charged.
Program Eligibility

- English, Grade 12 (ENG4C or equivalent).
- Mathematics, (Grade 12 MCT4C) or (Grade 11 MCR3U) or equivalent; or (Grade 12 MAP4C with a grade of 80% or higher) or (Grade 11 MCF3M with a grade of 70% or higher).
- Applicants with international transcripts must provide proof of the subject specific requirements noted above and may be required to provide proof of language proficiency. Domestic applicants with international transcripts must be evaluated through the International Credential Assessment Service of Canada (ICAS) or World Education Services (WES).
- IELTS-International English Language Testing Service (Academic) Overall band of 6.0 with a minimum of 5.5 in each band; OR TOEFL-Internet-based (iBT) Overall 80, with a minimum of 20 in each component: Reading 20; Listening 20; Speaking 20; Writing 20.

Should the number of qualified applicants exceed the number of available places, applicants will be selected on the basis of their proficiency in English and mathematics.

Refresher/upgrading courses are available through Academic Upgrading courses, the Centre for Continuing and Online Learning and through local school boards.

Note: Applicants should have basic computer skills such as keyboard proficiency, Internet browsing and searching, and proficiency with an office software suite (word processing, spreadsheets, etc.) prior to the start of the program. Training in these skills is available to students via the Student Learning Centre Coaching Lab in C260. While programming experience is not a requirement to enter the program, aptitude for programming is necessary and would include strong language, problem solving and logic skills. This is often demonstrated by skill and enjoyment in solving word problems in math.

Admission Requirements for 2020/2021 Academic Year

College Eligibility

- Ontario Secondary School Diploma (OSSD) or equivalent. Applicants with an OSSD showing senior English and/or Mathematics courses at the Basic Level, or with Workplace or Open courses, will be tested to determine their eligibility for admission; OR
- Academic and Career Entrance (ACE) certificate; OR
- General Educational Development (GED) certificate; OR
- Mature Student status (19 years of age or older and without a high school diploma at the start of the program). Eligibility may be determined by academic achievement testing for which a fee of $50 (subject to change) will be charged.

Program Eligibility

- English, Grade 12 (ENG4C or equivalent).
- Mathematics, Grade 12 (MAP4C or equivalent).
- International applicants must provide proof of the subject specific requirements noted above along with proof of either: (IELTS / TOEFL) IELTS-International English Language Testing Service (Academic) Overall band of 6.0 with a minimum of 5.5 in each band; OR TOEFL-Internet-based (iBT) Overall 80, with a minimum of 20 in each component: Reading 20; Listening 20; Speaking 20; Writing 20.
- Applicants with international transcripts must provide proof of the subject specific requirements noted above and may be required to provide proof of language proficiency.

Should the number of qualified applicants exceed the number of available places, applicants will be selected on the basis of their proficiency in English and mathematics.

Refresher/upgrading courses are available through Academic Upgrading courses, the Centre for Continuing and Online Learning and through local school boards.

Note: Applicants should have basic computer skills such as keyboard proficiency, Internet browsing
and searching, and proficiency with an office software suite (word processing, spreadsheets, etc.) prior to the start of the program. The Mobile Learning Center Coach (C102) offers training in these skills if needed. While programming experience is not a requirement to enter the program, aptitude for programming is necessary and would include strong language, problem solving and logic skills. This is often demonstrated by skill and enjoyment in solving word problems in math.

Application Information

COMPUTER PROGRAMMING (CO-OP AND NON CO-OP VERSION)
Program Code 0336X01FWO

Applications to full-time day programs must be submitted with official transcripts showing completion of the academic admission requirements through:

ontariocolleges.ca
60 Corporate Court
Guelph, Ontario N1G 5J3
1-888-892-2228

Students currently enrolled in an Ontario secondary school should notify their Guidance Office prior to their online application at http://www.ontariocolleges.ca/.

Applications for Fall Term and Winter Term admission received by February 1 will be given equal consideration. Applications received after February 1 will be processed on a first-come, first-served basis as long as places are available.

International applicants please visit this link for application process information: https://algonquincollege.force.com/myACint/.

For further information on the admissions process, contact:

Registrar’s Office
Algonquin College
1385 Woodroffe Ave
Ottawa, ON K2G 1V8
Telephone: 613-727-0002
Toll-free: 1-800-565-4723
TTY: 613-727-7766
Fax: 613-727-7632
Email: mailto:AskUs@algonquincollege.com

Additional Information

Programs at Algonquin College are Bring Your Own Device (BYOD). To see the BYOD requirements for your program, please visit: https://www7.algonquincollege.com/byod/.

Apply directly to the co-op or non co-op version of this program through OntarioColleges.ca or our International Application Portal.

Cooperative education (Co-op) allows students to integrate their classroom learning with a real-world experience though paid work terms. Two academic terms prior to the cooperative education work term, students are required to actively participate in and successfully complete the self-directed co-op online readiness activities and in-person workshops.

Students must actively conduct a guided, self-directed job search and are responsible for securing approved program-related paid co-op employment. Students compete for co-op positions alongside students from Algonquin and other Canadian and international colleges and universities. Algonquin College’s Co-op Department provides assistance in developing co-op job opportunities and facilitates the overall process, but does not guarantee that a student will obtain employment in a co-op work term. Co-op students may be required to re-locate to take part in the co-op employment opportunities available in their industry and must cover all associated expenses; e.g., travel, work permits, visa applications, accommodation and all other incurred expenses.

Co-op work terms are typically 14 weeks in duration and are completed during a term when students are not taking courses.

International students enrolled in a co-op program are required by Immigration, Refugees and Citizenship Canada (IRCC) to have a valid Co-op/Internship Work Permit prior to commencing
their work term. Without this document, International students are not legally eligible to engage in work in Canada that is a mandatory part of an academic program.

For more information, please visit https://www.algonquincollege.com/coop.

Program curriculum is reviewed annually to reflect evolving industry standards in the information technology field.

Several courses assist in the preparation for industry standard Java and Oracle certification examinations (CST2355, CST8276, CST8277, CST8284 and CST8288).

For more information regarding this program, please email: coordcp@algonquincollege.com or visit https://www.algonquincollege.com/sat/.

Course Descriptions

CST2234 Systems Analysis and Design

Guided by industry standard software engineering methodologies, students gain hands-on experience with case studies used to develop systems from inception through elaboration, construction and transition phases. Object-oriented design, modeling tools and techniques are used to produce system specifications. Project management principles are also used within team developed projects. Software methodologies discussed include the systems development life cycle (SDLC), agile approach, rational unified process (RUP) and rapid application development (RAD).

Prerequisite(s): CST2355 and ENL2019T
Corequisite(s): CST8288

CST2335 Mobile Graphical Interface Programming

Students explore graphical user interface programming in a mobile Android environment. Students learn how to program applications using the latest Android development tools. Topics include application architecture, interface design, network communication, and database integration.

Prerequisite(s): CST8215 and CST8284
Corequisite(s): none

CST2355 Database Systems

Students acquire practical experience using market-leading object-relational database management systems like Oracle and MySQL. Students obtain hands-on experience with advanced engineering modeling tools along with SQL, SQL scripts and programming with Oracle's PL/SQL blocks. Database concepts covered include advanced SQL, case structures, rollup and cube operations, metadata manipulation, data storage and retrieval, security and transaction control and data warehousing. Open source database software is also explored.

Prerequisite(s): CST8215
Corequisite(s): none

CST8101 Computer Essentials

The essentials of computer software, hardware, and laptop management form the foundation for building further technical programming skills. Learn to configure your laptop environment, basic PC and troubleshoot problems. Create backups, install virus protection, and manage files through a basic understanding of the Windows Operating System. Install and configure the Windows Operating System, and a virtual machine environment. Explore computer organization including basic numerical systems, functional hardware and software components needed to run programs.

Prerequisite(s): none
Corequisite(s): none

CST8102 Operating System Fundamentals (GNU/Linux)

Learn the basic concepts and components of Operating Systems (OS), and how they function and
interact with hardware and software components. Explore the details of operating system structures, process management, storage management, installation, configuration, and administration both in theory and through practical assignments based on the GNU/Linux operating system. Lab exercises are designed to demonstrate how to implement the theory by developing skills using the powerful GNU/Linux command-line tools and utilities.

Prerequisite(s): CST8101
Corequisite(s): none

CST8109 Network Programming

Software programming in today's environment requires detailed knowledge of the underlying network topology, its implementation and programming support functions. Gaining an appreciation and perspective of this technology is imperative to developing good network programming applications. Students explore topics including the basic structure, design and layered communications models, with an emphasis on data communications, TCP/IP protocol suite, socket programming and multi-threading concepts. Labs include practical exercises in basic networking and using socket programming, along with multi-threading, in an environment rich with common networking tools for diagnosing and troubleshooting typical network programming problems.

Prerequisite(s): CST8284 and MAT8001C
Corequisite(s): none

CST8116 Introduction to Computer Programming

Students receive an introduction to computer programming with emphasis on problem analysis and design, using algorithms, pseudocode, flowcharts, UML class diagrams and testing, with the Java programming language used as a means to implement problem solution designs. Instruction in the Java programming language is provided including an introduction to object oriented programming, sequential structure, selection structures, repetition structures, variables, constants, methods, constructors, one-dimensional arrays, classes, objects, encapsulation, abstraction, inputs, outputs, coding conventions and documentation. Theory is reinforced with application by means of practical laboratory assessments.

Prerequisite(s): none
Corequisite(s): none

CST8215 Introduction to Database

Students learn the fundamentals of Relational Databases design using Entity Relation diagrams, and use SQL to create, modify and query a database. Students design and create databases that are maintainable, secure and adaptable to change in business requirements, using Normalization. Students are able to compare and appreciate a Database Management System (DBMS) and its components with legacy systems.

Prerequisite(s): none
Corequisite(s): none

CST8276 Advanced Database Topics

Teams and individuals explore advanced database topics: database administration (using Oracle), data governance, globalization, security and advances in database technology. Topic coverage includes business intelligence, data warehouses, data visualization, big data, NoSQL and graph databases. Database administration tasks requiring knowledge of database architecture are examined: relational vs. non-relational models, security, performance, database distribution, database sharing, backup and recovery.

Prerequisite(s): CST2355 and CST8109
Corequisite(s): none

CST8277 Enterprise Application Programming
With a focus on the IT Enterprise, students are introduced to the application enterprise environment using and extending the technologies learned in previous courses. Topics studied may include the Java enterprise environment (JEE), the Microsoft .NET environment, Enterprise Android programming, cloud computing, security and the corporate database repository.

Prerequisite(s): CST8102 and CST8109 and CST8288  
Corerequisite(s):none

**CST8283 Business Programming**

Create COBOL programs in a business environment using structured methodology in the latest visual programming environment. Topics include: output design; logic design tools; structured, top-down and modular coding; testing and debugging; and documentation. The programs include interactive, file-based, and database processing of data related to business problems. Arrays, indexed files, database access and sub-programs are included.

Prerequisite(s): CST8284 or CST8132  
Corerequisite(s):none

**CST8284 Object Oriented Programming (Java)**

Learn object oriented programming methodology using the Java programming language. Object oriented concepts, such as encapsulation, inheritance, abstraction and polymorphism are covered and reinforced with practical applications.

Prerequisite(s): CST8116 or CST8110  
Corerequisite(s):none

**CST8285 Web Programming**

Learn the basics of web programming, website design and implementation. JavaScript, HTML5, and PHP are used to explore web-based solutions to problems of increasing interactivity and complexity. Lectures are reinforced by practical assignments that encourage students to construct and maintain their own websites.

Prerequisite(s): CST8116 or CST8110  
Corerequisite(s):none

**CST8288 Object Oriented Programming with Design Patterns**

Implement the best practices of object oriented program development with software design patterns. Apply UML program specifications in the Java programming language. Use embedded SQL through JDBC for developing and using “data access objects”. Course topics include refactoring, domain modelling, JDBC and multithreaded servlet programming. Students develop proficiency in creating, testing, debugging, deploying and documenting programs and servlets through practical application.

Prerequisite(s): CST8215 and CST8284  
Corerequisite(s):CST2234

**CST8300 Achieving Success in Changing Environments**

Rapid changes in technology have created personal and employment choices that challenge each of us to find our place as contributing citizens in the emerging society. Life in the 21st century presents significant opportunities, but it also creates potential hazards and ethical problems that demand responsible solutions. Students explore the possibilities ahead, assess their own aptitudes and strengths, and apply critical thinking and decision-making tools to help resolve some of the important issues in our complex society with its competing interests.

Prerequisite(s): none  
Corerequisite(s):none
CST8333 Programming Language Research Project

Learning a new programming language or framework on your own is a challenge faced by programmers on the job as part of their career. Students explore this process of self-study by applying project planning, applied research, testing, and implementation of basic and advanced concepts appropriate to the language or framework under study. Students develop major milestones and deliverables culminating in a project and reflective summary submission.

Prerequisite(s): CST8288
Corequisite(s): none

CST8334 Software Development Project

Following the agile software engineering methodology, teams work with clients to analyze business needs, determine computer system requirements, model system designs, build prototypes, test code and deliver final products. In some cases, the industry contacts are supplied through the Algonquin College office of Applied Research and Innovation. Project management techniques are used to monitor progress and organize tasks. Outside of in-class requirements, teams must participate in interviews, technical reviews, presentations and the preparation of technical reports. The culmination of the course is a final presentation and technical review, followed by the delivery of the finished product.

Prerequisite(s): CST2234 and CST2335 and CST8109 and CST8285 and CST8288 and ENL2019T
Corequisite(s): none

CST8390 Business Intelligence and Data Analytics

Business Intelligence (BI) can be broadly defined as a set of applications, infrastructure, and best practices that integrate and transform raw data into actionable information used for planning, monitoring and analyzing processes. The foundation underlying this process is the Data Analytics that explore the data, identify the relationships and patterns in a meaningful way. Students examine the components and best practices of Business Intelligence technology, and how it guides operational to strategic business decisions in the context of real-world applications. Data analytics techniques are used to derive insight using statistical software.

Prerequisite(s): CST8215 and CST8284 and CST8285 and MAT8001C or CST8132 or CST8238
Corequisite(s): none

ENL1813T Communications I

Communication remains an essential skill sought by employers, regardless of discipline or field of study. Using a practical, vocation-oriented approach, students focus on meeting the requirements of effective communication. Through a combination of lectures, exercises, and independent learning, students practise writing, speaking, reading, listening, locating and documenting information and using technology to communicate professionally. Students develop and strengthen communication skills that contribute to success in both educational and workplace environments.

Prerequisite(s): none
Corequisite(s): none

ENL2019T Technical Communication for Engineering Technologies

The ability to communicate effectively in a technically-oriented interdisciplinary workplace is a foundational skill in an innovation-driven economy. Students are exposed to exercises and assignments designed to foster independent and collaborative critical thinking, research, writing, visual communication and presentation skills related to technical topics.

Prerequisite(s): ENL1813T
Corequisite(s): none

GED0336 General Education Elective
Students choose one course, from a group of general education electives, which meets one of the following four requirements: Arts in Society, Civic Life, Social and Cultural Understanding, and Science and Technology.

Prerequisite(s): none  
Corerequisite(s): none

**MAT8001C Technical Mathematics for Computer Science**

The study of algebraic and transcendental functions is an essential prerequisite to Calculus. Students manipulate algebraic expressions, solve algebraic equations and linear systems and learn the properties of and graph algebraic and transcendental functions. Students investigate computer number systems in addition to Boolean algebra and logic to help solve problems involving computer systems. Students also study the addition and subtraction of vectors using vector components. Delivered in a modular format, this course is equivalent to the completion of all of the following math modules MAT8100 - A, B, C, D, E, F, H, and L.

Prerequisite(s): none  
Corerequisite(s): none

**WKT8001 Work Term I**

Students complete a cooperative work term, and submit a written report which documents the location of employment and the duties performed.

Prerequisite(s): none  
Corerequisite(s): none

**WKT8002 Work Term II**

Students complete a cooperative work term, and submit a written report which documents the location of employment and the duties performed.

Prerequisite(s): WKT8001  
Corerequisite(s): none